A McREL Report Prepared for

Stupski Foundation's Learning System

Curriculum

About McREL

Mid-continent Research for Education and Learning (McREL) is a nationally recognized, private, nonprofit organization dedicated to improving education for all students through applied research, product development, and service. Established in 1966, McREL now maintains a staff of around 110 in its Denver, Colorado, office.

This report is part of a larger set of reports prepared by McREL for the Stupski Foundation. The views, findings, conclusions, and recommendations expressed herein are those of the authors and do not necessarily express the viewpoint of the Foundation. Please e-mail any inquiries to Linda Brannan at info@mcrel.org.

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Executive Summary

This document is one of eight reports prepared to support the development of a new learning system, a development effort that is the first step in a major initiative undertaken by the Stupski Foundation. The Foundation endeavors to improve the life options of all students, especially underserved urban youth of color, whom we refer to as "Our Kids," by fundamentally redesigning the education system.

This report was created collaboratively by researchers from McREL with guidance from officers of the Stupski Foundation. Its purpose is to provide members of a "Design Collaborative" team—consisting of practitioners, parents, students, and researchers—with a review of key findings from existing literature to support their efforts to develop the curriculum component of the Stupski Foundation's Learning System.

Research methodology

McREL researchers, in collaboration with Stupski Foundation staff members, generated the following research questions to guide this review:

1. What content should be included in a college readiness curriculum?
2. To what extent do current curricula align with college readiness criteria?

While McREL researchers concentrated on these two questions, they did so always with an eye toward what worked for students of color and poverty. The discussion section specifically addresses how the findings inform curricular decisions for this target population.

These questions focused an extensive review of scholarly (i.e., peer-reviewed publications) and "fugitive" literature (i.e., reports self-published by reputable foundations, associations, and other organizations). In all, the research team reviewed 161 articles and summarized 120 of these. Data and conclusions from these reports have been synthesized into several key findings.

Key findings

Findings are presented in three areas: 1) what to include in college readiness curricula, 2) the extent to which current expectations and curricula for high school graduates align with expectations for college and the workplace, and 3) a "bonus" set of findings—alternative curricular pathways.

Content of college readiness curriculum

The following findings emerged from the research regarding curricular expectations for college readiness:

- All students require more rigorous curricula to be successful, whether they plan to attend college or enter the workforce.
- Several course taking patterns—perhaps most notably the successful completion of Algebra I and II courses—appear to be important predictors of college success.
- "Less is more" (i.e., fewer topics at greater depth) when identifying curriculum for college readiness.
- Significant differences exist among identified college readiness standards, including a focus on different subjects, the use of different methodologies for identifying standards, and the identification of different content, even when similar subjects are examined.
- Current college readiness standards do not specify content for learning at the early grades, specifically those at the elementary level.

Current K–12 expectations versus college readiness factors

The following findings emerged from the research regarding the extent to which existing curricula and expectations for high school graduates align with college and workplace expectations:

- Current state standards do not align with expectations for college and the workplace.
- Students of color are less likely to receive rigorous curricula.
- States are currently engaged in multiple efforts to align standards with college readiness standards.
- Local efforts to translate standards into curricula appear to be of uneven quality.
- Existing systems for high school credits reward students for "seat time," not attained curriculum.

Alternative curricular pathways

While not a focus for either of the original research questions, many of the reports examined in this review highlighted the importance of alternative curricular pathways:

- Career and technical education curricula increase student engagement, achievement, and earning power.
- Early experiments to allow students to proceed through a curriculum at their own pace show promise in engaging students and improving achievement.
- Programs providing students with early exposure to college-level curricula and learning environments show promise for preparing them for college success.

Recommendations

Based on these findings, five options are offered for how the Design Collaborative might proceed with its efforts.

Option 1: Develop curricula aligned with the common core initiative

One option the Design Collaborative might pursue would be to develop a college readiness curriculum built around standards, namely the Common Core Initiative, which to date 46 states and three territories support. Potential benefits to this option include leveraging existing efforts and opportunities to take the curriculum to scale nationwide. Challenges and drawbacks of this option include the possibility that the Common Core effort is unsuccessful; for example, that many states ultimately do *not* agree to adopt the standards or the identified standards do *not* accomplish their stated purposes of providing more rigorous and focused expectations for student learning.

Option 2: Develop new college readiness standards and curricula

An alternative to building a curriculum aligned with the Common Core Initiative would be to synthesize existing standards, or develop a new set of standards, to guide the subsequent development of an aligned curriculum. Potential benefits of this approach include an opportunity to create standards that identify important psycho-social skills, which are unlikely to be addressed in the Common Core Initiative, and to create a more focused and rigorous curriculum that describes multiple pathways for both college- and

workplace-bound students. Potential challenges and drawbacks include a more lengthy development cycle and the possibility that the Common Core effort *is* successful and thus, states and districts become reluctant to adopt a curriculum they do not perceive to be aligned with these expectations.

Option 3: Adopt or adapt an existing college readiness curriculum

This option highlights the potential benefits of foregoing time- and labor-intensive standards and curriculum development efforts in favor of adopting an *existing* college readiness curriculum, such as the International Baccalaureate (IB) curriculum. IB is an internationally respected, comprehensive (ages 3–19), college readiness curriculum for use in schools around the world. Potential benefits of this option include a shortened development cycle, the ability to leverage existing resources and materials, and the opportunity to connect teachers of Our Kids to a global community of educators. Possible challenges and drawbacks of this approach include the need to provide significant professional development to teachers and adequate supports for students.

Option 4: Create a multi-pathway school district

Alternatively, the Design Collaborative might focus its efforts on adopting (or adapting) existing district reform models that provide students with multiple curricular pathways, such as the Mapleton (Colorado) School District 1 approach. In Mapleton, an urban fringe district, each school offers a unique curricular program, such as Core Knowledge, Expeditionary Learning, International Baccalaureate, or Big Picture Company project-based learning. Potential benefits of this approach include a shortened development cycle and the ability to serve the needs of both college- and workplace-bound students. Challenges and drawbacks of this approach include addressing transportation logistics, educating parents and students about different school models, and ensuring the long-term commitment and cooperation of school administrators, the community, and teachers.

Option 5: Develop computer-based, individualized curricula

This final option suggests developing computer-based learning modules aligned with existing or newly developed college readiness standards. Potential benefits of this approach include creating a curriculum customized to student learning styles, as well as a "disruptive innovation" that transforms the education system. Challenges and drawbacks include an extensive development cycle, competition from existing providers of online learning programs, and the possibility that this "high tech" approach may not support all students, especially those who appear to benefit from more "high touch" learning environments.

Final thoughts

Students' needs are varied, and a one-size-fits-all approach to curriculum may or may not meet those needs. A caveat lies in the unsuccessful history of previous reformers to create "teacher-proof" curricula. The Design Collaborative might address the apparent need to both individualize *and* standardize learning for students when developing a curriculum for the Learning System.

Introduction

Purpose of this document

This document is one of eight reports prepared to support the development of a new learning system, a development effort that is the first step in a major initiative undertaken by the Stupski Foundation. The Foundation endeavors to improve the life options of all students, especially underserved urban youth of color, whom we refer to as "Our Kids," by fundamentally redesigning the education system.

The report was created collaboratively by researchers from McREL and officers of the Stupski Foundation. Its purpose is to provide members of the Design Collaborative team with a review of key findings from the existing literature regarding critical research questions related to the curriculum component of the Learning System and to offer recommendations for the development of this component. Together, the reports cover these topics:

- Assessment
- Curriculum
- Pedagogy
- Student Supports
- Systems Diagnostics
- Leadership
- College Readiness
- Our Kids

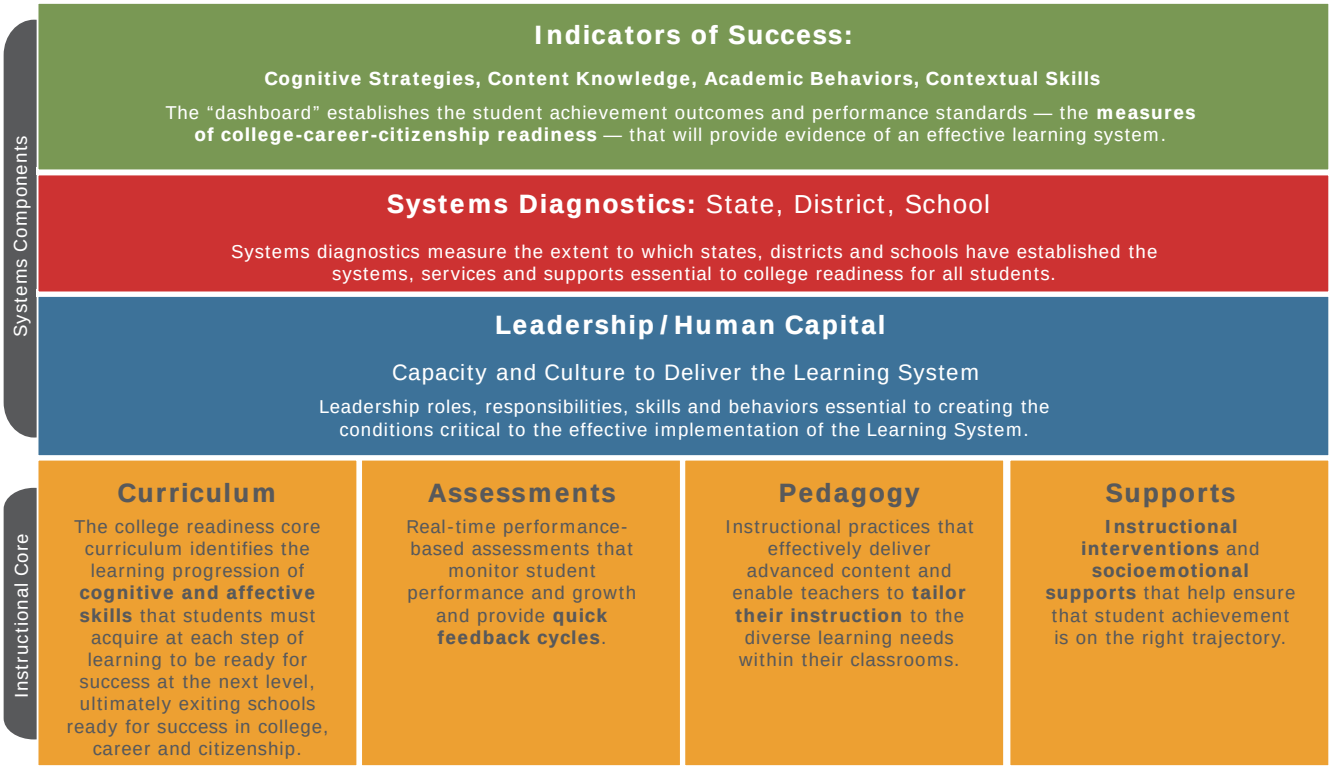
The first section of this report provides salient findings that emerged from the literature review. The second section offers a discussion of the findings along with several recommendations—framed as five key options—for how the Design Collaborative might proceed. A brief concluding discussion follows. Summaries of the studies and literature reviewed for this report were provided as separate documents.

About the Learning System

The Learning System is the product of the Stupski Foundation's extensive examination of research, best practices, and theories of action for improving education opportunities for all children. It is deeply rooted in the Foundation's mission to foster innovation in public school systems so that all students graduate ready for college, career, and success—as well as the notion that the United States' education system, in its current state, is incapable of accomplishing this goal. As stated on the Foundation's Web site, "The basic components of what public education systems need to teach all students to world-class standards, particularly those students for whom public schools are their only option, do not exist in any coherent, accessible or evidence-based way" (Stupski Foundation, n.d.).

Thus, the Foundation has focused its philanthropic efforts on supporting the "fundamental reinvention" of the American system of public education into one that prepares all children for the challenges of life, career, and citizenship in the 21st century. To accomplish this objective, the Foundation launched a multi-year, cross-sector collaboration among researchers and practitioners from inside and outside education to develop a new and comprehensive Learning System. In its June 2008 *Strategy and Program Overview*, the Foundation posited that this system includes seven components, shown in Figure 1 (see p. 6). The indicators of success are dependent on a definition of college readiness, which is addressed in the respective report. Although Our Kids is not an explicit component of the Learning System, it is the foundation for the work the Stupski Foundation is committed to in the education sector. As such, the populations of students of color and students of poverty warranted a separate report.

Figure 1: The Learning System



About "Our Kids"

The Stupski Foundation is committed to addressing the academic needs of underserved populations, in particular, students who are of color *and* in poverty (which comprises 42% of African American students and 37% of Hispanic students) (Duncan & Magnuson, 2005). Despite a dramatic rise in minorities enrolling in college (a 50% increase from1995–2005), fewer minorities appear to be graduating. As shown in Figure 2 (see p. 7), in 2006, fewer minorities aged 25–29 reported having obtained an associate degree or higher than their older peers (aged 30 and over) (American Council on Education, 2008). This trend marks an important reversal in advances in educational opportunities for minorities and may mark the first time in history that a generation of students has demonstrated less educational attainment than its predecessors (American Council on Education, 2008).

Overview of methodology

McREL researchers followed a five-step process for translating findings into recommendations.

Step 1: Identification of key hypothesis

After conducting an initial survey of relevant literature, Stupski Foundation staff members identified the following hypothesis to guide the literature review for the curriculum component:

Curriculum as it exists today inadequately prepares Our Kids for success in college, work, and life.

Step 2: Identification of research questions

McREL researchers, in collaboration with Stupski Foundation staff members, generated these questions:

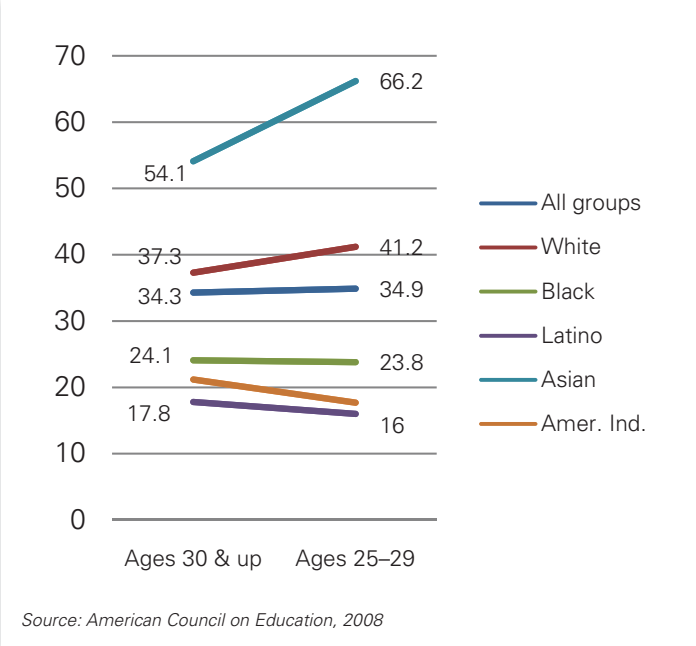
1. What content should be included in a college readiness curriculum?
2. To what extent do current curricula align with college readiness criteria?

While McREL researchers concentrated on these two questions to guide the curriculum literature review, they did so always with an eye toward what worked for students of color and poverty. The discussion section addresses specifically how the findings inform curricular decisions for this target population.

Step 3: Literature search

The two research questions guided a search in several journal databases (e.g., Academic Search Premier, JSTOR, ERIC, Proquest, Academic Onefile, Educators Reference Complete), sites funded by the U.S. Department of Education (e.g., ERIC, What Works Clearinghouse, Doing What Works, National Laboratory Network, and those of national comprehensive centers and national education research centers), and other sources, including Google Scholar and Educational Policy Analysis Archives. In addition, the Table of Contents of certain journals

Figure 2: Percentage of U.S. adults with associates degree or higher, 2006



Source: American Council on Education, 2008

(e.g., *Curriculum Inquiry, Education and Urban Society, Equity and Excellence in Education, Journal of Education for Students Placed at Risk, Journal of Curriculum and Supervision, Journal of Latinos and Education, Journal of Research in Mathematics Education, New Directions in Youth Development*) were systematically reviewed because of their apparent relevance to the search topic. Sources were searched by the following keywords:

- Academic achievement
- Accelerated learning opportunities
- African American students
- At-risk students
- Career academies
- Career and technical education
- Career pathways
- College/postsecondary success
- College readiness curriculum
- Curriculum
- Dual enrollment programs

- English-language learners
- Exit expectations
- Expectations gap
- Graduation requirements
- High school curriculum
- Hispanic students
- Innovative curriculum
- Language arts curriculum
- Mathematics curriculum
- Poverty
- Reading curriculum
- Science curriculum
- Second-language learners
- Socio-economic status
- Standards alignment
- Urban education

The research team also examined reference lists of articles identified in the first scan to find other applicable studies for all the components of the Learning System. They initially identified 141 articles related to curriculum. During the writing and quality assurance phase of this project, a secondary search yielded 20 additional articles of important authors in this field, for a total of 161. All identified articles were retrieved and reviewed with attention to research methods, outcomes, and recommendations for future study. Ultimately, the team summarized 120 articles related to curriculum, which are in a separate annotated bibliography.

Step 4: Identification and cataloging of findings

The research team cataloged findings from the summarized articles using the following identifications:

- Counterproductive *orthodoxies* (conventional ways of providing education which may be impeding student success)
- *Unmet needs* (areas where students are not yet well served by the current system of education)
- *Next practices* (a program or practice that needs to be developed, adapted, invented, and tested in response to an unmet need)
- *Promising practices* (practices based on research but not supported by rigorous efficacy data)
- Current *best practices* (practices demonstrated by research to be effective in improving outcomes for students)

Step 5: Generation of recommendations

In the final phase, research team members collectively reviewed key findings from the literature review in light of the following questions:

- What are the critical unmet needs related to this component of the Learning System?
- What is missing in current practices within this component of the Learning System?

- What is working and why?
- What is *not* working and why?
- What are the biggest misalignments between research and current practice?
- What things should educators do differently in light of the research findings?
- Where is the knowledge base too inconclusive to guide education innovation?
- Where is more research needed to advance practice?

Responses to these questions were synthesized into recommendations, presented here as options for further action. These options include best or promising practices that should be *adopted* and scaled up or *adapted* to new settings or areas where there are gaps in practices that require new innovations to be *invented.*

Overview of the literature base examined

For the purpose of this report, McREL researchers first defined curriculum as the specific coursework and graduation requirements that students should master to be prepared for college. Initial searches revealed findings about content areas (e.g., mathematics, science, literacy) through the lens of college readiness with a particular focus on Our Kids. The researchers did not strongly distinguish between curriculum and standards; rather, as the work progressed, the researchers expanded the view of curriculum to include a broad range of experiences or frameworks through which students experience standards and curriculum. Thus, a broad concept of curriculum is used throughout the report, including academic content, psycho-social skills, and experiences that enhance the attainment of knowledge and skills.

This report contains numerous references to a "rigorous curriculum." The National Assessment of Educational Progress (NAEP) uses standard definitions to distinguish between curriculum levels. The research team relied on these levels to provide guidance throughout the review process. A rigorous curriculum as defined by NAEP (n.d.) is one that includes minimum expectations for the number of years that students spend taking courses in English, social studies, mathematics, science, and a foreign language. This course-taking pattern indicates the level of rigor of a curriculum (Shettle et al., 2008), suggesting that students who complete the course of study are prepared for college enrollment.

Caveat regarding use of National Assessment of Educational Progress (NAEP) terminology

While this report relied on curriculum levels as defined by NAEP, the authors acknowledge the ongoing debate about the NAEP's definition of standards and related imperfections associated with the determination of achievement levels. In this case, reliance on NAEP curriculum level definitions served to clarify the meaning of a rigorous curriculum and not to endorse or engage in the deliberations about achievement levels.

The research team found a growing body of literature concerning the expectations of colleges and employers for what high school graduates should know and be able to do. Many of these documents were studies that aimed to synthesize these expectations and subsequently examined the extent to which current K–12 curricula align with them.

Several studies sought to identify, with more quantitative precision, correlations between students' course-taking patterns and their rates of enrollment or acceptance into colleges (e.g., students who successfully complete Algebra II courses are more likely to succeed in college). Another significant portion of the literature consists of case studies. For example, there are many studies that examined student outcomes in high schools that are engaged in career-based comprehensive reform efforts. Still others attempted to document and distill key characteristics of school reform efforts, describing, for example, what high-poverty, high-performing schools have done to simultaneously raise academic standard requirements and

graduation rates. These reports provide rich qualitative data regarding program implementation and some interesting quantitative data regarding student outcomes, yet their limited sample size and lack of randomized controlled designs make it difficult to draw causal conclusions about the effects of the programs or practices.

Among the experimental research conducted to date in this area are several efficacy trials of particular curricular programs, such as the Core-Plus Mathematics Project, Saxon Middle School Math, and Reading Mastery. Some of these studies have identified statistically significant positive results on student achievement for particular mathematics or reading programs and thus, offer some guidance to educators for selecting specific curricular programs. Nonetheless, each study sought only to determine whether a particular program helps students demonstrate higher levels of achievement on a standardized achievement test during the intervention period, and not whether students have become more likely to succeed in college or the workplace. In short, these studies seek to answer questions about the effectiveness of particular curricular programs, not "big picture" questions about what students must know and be able to do to increase their life options. Nor do they answer "small grain size" questions regarding particular aspects of the curriculum that are most beneficial to students.

In summary, the literature reviewed, and the findings that follow, are derived from a variety of sources representing an array of research methodologies. In light of the difficulty of conducting experimental research on something as broad and long-term as a K–12 curriculum, the Design Collaborative will need to draw upon these data, but also professional wisdom when developing a college readiness curriculum for Our Kids. This includes applying a practical understanding of how to develop critical learning pathways for students; insights into the increasing demands of college and workplace environments; and cross-disciplinary examinations of promising practices in other fields, including new software, simulation, and gaming technology.

In addition to the two research questions originally posed, The McREL research team investigated questions and issues that arose as a result of the initial searches.

Findings

Content of college readiness curriculum

This section addresses the first research question, "What content should be included in a college readiness curriculum?"

All students, regardless of whether they plan to attend college or enter the workforce, require more rigorous curricula

Several reports conclude that in order to compete in the global marketplace and establish financial stability, today's students will require postsecondary education or training, if not a college degree, to maintain reasonable earning power (Barth, 2003; National Governors Association, 2008b). Furthermore, a recent ACT (2006b) report titled *Ready for College and Ready for Work: Same or Different?* concluded that students need the same level of proficiency in reading and mathematics skills for college entry as they do for the vast majority (90%) of occupations that do not require college preparation, yet offer a wage that will support a small family (e.g., electricians, construction workers, upholsterers, and plumbers). After comparing these scores with the scores required to demonstrate college readiness on the ACT exam, ACT researchers concluded that "whether planning to enter college or workforce training programs after graduation, high school students need to be educated to a comparable level of readiness in reading and mathematics" (ACT, 2006b, p. 1). In a separate report on this topic, ACT researchers concluded this: "The study results convey an important message to U.S. high school educators and high school students: We should be educating all high school students according to a common academic expectation, one that prepares them for both postsecondary education and the workforce" (ACT, 2006b, p. 1).

Increasingly, preparation for both postsecondary education and workforce success emphasizes cognitive skills (Levy & Murnane, 2004; Murnane, Willett, & Levy, 1995). Addressing this issue in relation to technology, Levy and Murnane (2004) highlighted the importance of analytic skills, such as those needed to make sense of and draw connections between facts and other pieces of information. They also recognized that jobs with wages sufficient to support a family required strong communication skills, particularly the type of communication that enables workers to deal with complex issues not easily handled by technology. Clearly, these skills, and others, demand a level of rigor that exceeds typical content area expectations.

The cognitive skills that Levy and Murnane advocate hint at the idea of more situated learning (Lave & Wegner, 1991), which contributes to success in the workplace and in postsecondary education. This informal learning is nothing new (Scribner & Cole, 1973). As Scribner and Cole explain, informal learning "occurs in the course of mundane adult activities in which the young take part according to their abilities. There is no activity set aside solely to 'educate the child'" (pp. 554–555). Within this context, students of all ages are engaged in apprenticeships, subjecting them to a broad range of academic expectations that exceed mere book learning.

Several course-taking patterns correlate with student success in college and work

Many studies have examined course sequences to determine how they stack up against the entry requirements of post-secondary institutions. One recent report found that no high school graduation requirements align fully with college admissions requirements (Dounay, 2006). The following sections describe which course-taking patterns are most often correlated with student success in college.

Key finding

The level of mathematics taken is a strong predictor of whether a student will graduate from high school, complete a four-year college degree, or need remedial courses in college.

Mathematics. Numerous studies have identified a positive correlation between students taking higher level mathematics courses in high school and postsecondary success (Achieve, 2008b; ACT, 2006a; Martinez & Klopott, 2005). The level of mathematics taken is a strong predictor of whether a student will graduate from high school, complete a four-year college degree, and need remedial courses in college. In addition, higher level mathematics classes instill reasoning skills and habits of mind that may be utilized in all college-level courses. As Achieve (2008a) noted in a recent policy brief, disadvantaged or minority students, in particular, are less likely to take higher level mathematics classes, thus maintaining the achievement gap.

A seminal document in the area of mathematics curriculum is the report from the National Mathematics Advisory Panel (2008). The panel, created by the U.S. Department of Education, was commissioned to use "the best available scientific evidence" to identify answers to questions such as these:

What is the essential content of school algebra and what do children need to know before starting to study it?

What is known from research about how children learn mathematics?

What do practicing teachers of algebra say about the preparation of students whom they receive into their classrooms and about other relevant matters?

After reviewing the research, the panel concluded that algebra is a "central concern," as it appears to serve as a critical gateway to student success in college and the workplace. For example, the panel report notes that "students who complete Algebra II are more than twice as likely to graduate from college compared to students with less mathematical preparation" (p. xiii). To ensure higher levels of participation in algebra courses and more success in them, the panel recommended a streamlined PreK–8 mathematics curriculum that would emphasize topics that students should understand to be prepared for algebra coursework (e.g., "polynomial expressions," "real numbers as points on the number line," and "factors and factoring of quadratic polynomials with integer coefficients") (p. 16). The report notes that these topics are not meant to represent the entirety of mathematics curricula; nonetheless, it suggests that U.S. schools need to focus mathematics curricula on presenting fewer topics at each grade level but in greater depth, like the curricula of the highest performing countries on the TIMSS test.

Earlier, the National Research Council's (2001) *Adding It Up: Helping Children Learn Mathematics* offered similar advice. The report, which focused on pre-K–8, also suggested that schools employ a coordinated curriculum that capitalizes on what students already know about mathematics, develops number fluency, and connects to a conceptual understanding of how numbers and variables relate.

Language arts. ACT has found that a far higher percentage (75%) of students who take four years of high school English demonstrate readiness for college English courses than those who take fewer than four years (56%) (ACT, 2008a). Another, less direct link between language arts courses and college success may be that these courses can encourage students to read regularly for pleasure outside of school, which research has shown to be associated with higher levels of academic performance, even after controlling for the effects of previous academic records and family backgrounds (Phillips, 2008). In addition, language arts courses may play a crucial role in helping students develop critical analysis and higher order thinking skills, which most studies agree are vital to college and workplace success (Achieve, 2004; Kendall & Snyder, 2005). Finally, language arts courses can help students develop strong writing skills, which are in high demand on both the college campus and the workplace. The National Commission on Writing's report, *The Neglected R* (2003), notes that more than 90 percent of midcareer professionals have cited the importance of being able to write effectively in their work (Light, 2001 as cited in National Commission on Writing, 2003).

Science. ACT (2007b) reports that students who take four years of science in high school are more likely to exceed its college readiness benchmarks in science—the level of achievement required for students to have a high probability of success (a 75% chance of earning a course grade of C or better or 50% chance of earning a B or better) in credit-bearing, first-year college courses. Specifically, it found that 38 percent of students who took four years of science met these benchmarks, compared with just 27 percent of students who took only three years of high school science courses. In urban settings, ACT (2007a) found that only 10 percent of students who take fewer than three years of science meet the benchmarks as compared to 29 percent of students who take at least three years of science, namely biology, chemistry, and physics.

The National Academy of Sciences further stresses the importance of inquiry in these science courses. By focusing on inquiry, students gain valuable experience with problem solving, communication, and thinking skills (Center for Science, Mathematics, and Engineering Education & National Research Council, 2000). As Bruce Alberts, the National Academy of Sciences' former president stated, "Most students are not interested in being quiz show participants," (p. xii) reciting discrete facts absent from relevant connections to future careers and citizenship. More important, reciting discrete facts does little to ensure deep understanding of science. As further noted in *Taking Science to School* (National Research Council, 2007), student proficiency in science includes the ability to:

- know, use, and interpret scientific explanation in the natural world;
- generate and evaluate scientific evidence and explanations;

Caveats regarding research on course-taking patterns

Two caveats are in order with findings related to course-taking patterns. First, these patterns represent a large grain size, making it difficult to discern exactly what knowledge and skills contained within those courses are most important to students' later academic success. Second, most studies in this area are correlational, not causal, making it difficult to discern whether the knowledge gained, for example, from an Algebra II course is truly vital to college success, or whether the various dispositions, background knowledge, and external factors that prompt students to enroll in an Algebra II course are the more important contributors to their later academic success.

- understand the nature and development of scientific knowledge; and
- participate productively in scientific practices and discourse.

These expectations require a much more extensive review of student course-taking patterns with particular attention to the content students actually encounter.

The "less is more" paradox

Finally, as educators align K–12 standards to college and workplace expectations, they must consider depth of content. According to ACT (2007b), there is a marked disagreement between secondary and postsecondary instructors about depth versus breadth of knowledge. While K–12 instructors tend to value teaching a wide variety of topics within a subject area, postsecondary instructors concentrate on in-depth learning related to fewer topics. Currently, state standards in the United States cover more topics at each grade level than any other nation. Given too much content to cover in a school year, teachers choose to cover different content, which creates large variances in course content and quality (National Governors Association, 2008a).

For example, in the area of biology, the National Research Council (NRC), after a two-year examination of the AP and IB high school biology programs, noted that, "Recent research on learning indicates that often 'less is more'; in other words, more real learning takes place if students spend more time going into greater depth on fewer topics, allowing them to experience problem solving, controversies, and the subtleties of scholarly investigation" (Wood, 2002, sec. 3, p. 8). This, however, is not an excuse to devote unreasonable amounts of time to topics easily covered in shorter periods of time. In fact, students who manage their time effectively, an essential academic behavior (Conley, 2007), are more successful in their postsecondary endeavors. Still, in their recommendations, the NRC panel calls for both programs to develop curricula that are "built around 'big ideas' … and an understanding of the experimental method" so that students may "experience science as a process of creative thinking and problem solving" (Wood, 2002, sec. 3, p. 8).

Significant differences exist among current college readiness standards

The following organizations have developed standards and related benchmarks that identify what students should know and be able to do in order to be successful in entry-level college courses:

- ACT
- The American Diploma Project (ADP)

- Standards for Success (S4S)
- College Board
- Transitions Mathematics Project

The standards documents created by these organizations differ in the subject areas covered (see Table 1), approaches taken to identifying the standards, and underlying education philosophies that appear to have guided content selection.

Different methodologies employed. The ACT standards (2009) were derived from an analysis of the specific procedural knowledge in life sciences, physical sciences, and earth/space sciences that correlate with higher levels of success on the ACT test, which in turn, correlate with student success in college. The standards state, for example, that students who score in the 16–19 range should be able to "Select two or more pieces of data from a simple data presentation," while students who score in the 13–15 range may only be able to "Select a single piece of data (numerical or non-numerical) from a simple data presentation."

The American Diploma Project, a partnership of Achieve, The Education Trust, and the Thomas B. Fordham Foundation spent nearly two years working with two- and four-year post-secondary faculty and front-line managers in high-growth, high-skill occupations to define the core knowledge and skills that high school graduates need to succeed in their organizations. Its focus was on "what it takes for graduates to compete successfully beyond high school—either in the classroom or in the workplace" (American Diploma Project, 2004, p. 1). The standards, reported in *Ready or Not: Creating a High School Diploma that Counts* (American Diploma Project, 2004), describe expectations, or benchmarks, for English and mathematics and include sample tasks and assignments that illustrate how the knowledge and skills captured in the benchmarks might apply in the workplace or college classroom.

Standards for Success, a project sponsored by the Association of American Universities in partnership with The Pew Charitable Trusts, sought to identify what graduating high school students need to know and be able to do to succeed in entry-level university courses. These student expectations, termed Knowledge and Skills for University Success, are presented in *Understanding University Success* (Conley, 2003), the product of a two-year study in which more than 400 faculty and staff members from 20 research universities participated in extensive meetings and reviews.

College Board's (2006) approach included convening committees of middle school and high school teachers, college faculty, as well as experts in a variety of areas, including subject matter, assessments, and standards. To determine the academic demands students face in an AP or first-year college course in English language arts and mathematics and statistics, the committees reviewed the content of relevant college placement exams and analyzed the

Table 1: Subjects addressed by existing college readiness standards documents

Standards	Mathematics	English	Reading	Writing	Science	Social Studies	The Arts
ACT	✓	✓	✓	✓	✓		
ADP	✓	✓					
S4S	✓	✓	✓	✓	✓	✓	✓
College Board	✓	✓					
Transitions Mathematics	✓						

content of first-year college courses. College Board claims its definitions of college readiness are "the most rigorously researched, empirically validated definitions of college readiness available" (p. iv).

The Transitions Mathematics Project (n.d.) was a partnership of high school and college educators, students, and parents in the state of Washington who engaged in "in-depth reviews of existing efforts in education, ensuring an empirically sound, systematic process of standards development" (p. 1). The goal of the project was to extend existing state standards in mathematics to provide "clear guidance to help teachers build a curricular bridge for students to follow as they make a successful transition to post-high school opportunities" (p. 1). More specifically, the initiative sought to identify "basic expectations" for entry-level college math (and other disciplines requiring quantitative reasoning) in Washington's two- and four-year public institutions.

Key finding

Significant differences exist between the standards identified by the workplace-oriented American Diploma Project and the college-oriented Standards for Success initiative.

Different content emphasized. The different methodologies have generated significant differences in the content each set of standards identifies as necessary for students to know and be able to do in order to succeed in college and the workplace. A 2007 analysis conducted by McREL's regional educational laboratory (REL Central) for the Institute of Education Sciences found significant differences between the content identified in the ADP and S4S documents—the two sets of standards shared only 57 percent of their mathematics content and just 25 percent of their English language arts content (Kendall, Pollack, Schwols, & Snyder, 2007). The researchers attributed some of these discrepancies to the different groups surveyed by ADP and S4S. For example, S4S, which surveyed university professors, calls for a strong background in literature, while the American Diploma Project, which surveyed higher education faculty and employers in high-growth industries, calls for strong teamwork skills.

Key finding

No existing college readiness standards documents articulate expectations for grades before middle school.

Finally, in a departure from other standards documents, The Transitions Mathematics initiative, an effort funded by the Bill and Melinda Gates Foundation and the State of Washington, identified not only what students should know and be able to do, but also soft skills, encapsulated as four "student attributes": 1) demonstrating intellectual engagement, 2) taking responsibility for their own learning, 3) persevering when faced with time-consuming or complex tasks, and 4) paying attention to detail.

Current college readiness standards do not specify content for early grades learning

Standards provide transparency to educators, students, and parents about the academic expectations held for students in a given grade or course. In this way, standards help ensure that student knowledge and skills build over time and adequately prepare students for college or work. Numerous

studies emphasize the importance of creating rigorous grade-by-grade standards that progress in a logical sequence from elementary through post-secondary education (Achieve, 2008c; ACT, 2007a; Bottoms, 2007; State Higher Education Executive Officers, 2007). However, most college readiness documents only articulate expectations for high school students. One exception, the College Boards' *Standards for College Success* (2006), describes a continuum of knowledge and skills from middle school through high school for English language arts and mathematics. Nonetheless, no college readiness standards documents articulate expectations for grades before middle school, omitting a significant portion of benchmarks expectations for students' academic success.

Although no college readiness standards documents describe student expectations prior to middle school, the concept of learning progressions, particularly in science and mathematics, is gaining traction. Distinct from what Corcoran, Mosher and Rogat (2009) describe as "sequences of topics and learning experiences based only on logical analysis of current disciplinary knowledge and on personal experiences in teaching" (p. 15), learning progressions represent "pathways" that students follow toward mastery of content area concepts. What distinguishes learning progressions from the standard way of describing curriculum is the emphasis on *how* students learn. As such, learning progressions build on what students know, resulting in the possibility of building more complex and in-depth understanding over time. Heritage (2008) notes learning progressions should bring together and illustrate "knowledge, concepts and skills within a domain" (p. 4). More importantly, a single learning progression will not meet the needs of all children; a variety of learning progressions are needed to reflect the diversity of students' backgrounds and learning styles (National Research Council, 2007).

Despite these efforts, ACT (2007b) notes that many students start high school without the skills they need to be successful, and 9th-grade teachers spend between one-fourth and one-third of their time re-teaching skills that should have been learned prior to high school. Bottoms and Timberlake (2007) point out that success in 9th grade is a key indicator to graduation and postsecondary success, but that as high schools raise expectations and increase rigor, dropout rates in 9th grade are increasing. Ninth grade is particularly crucial for low-income and minority youth (Finkelstein & Fong, 2008). To stem dropout rates and ensure students are prepared for more rigorous high school coursework, studies recommend that middle school students take Algebra I by the end of 8th grade (Cooney & Bottoms, 2003; USDOE, 1997). In addition, new reports indicate that students fall behind in later years if reading instruction is neglected in the middle and high school years (Deakin, 2009).

Furthermore, research suggests rigorous standards in elementary school help close the achievement gap (Dougherty, Mellor, & Smith, 2006). Successful school programs around the world share a strong focus on numeracy and literacy in the early years (Barber & Mourshed, 2007). Building a rigorous foundation in reading and mathematics strongly correlates with improved future outcomes for students. In addition, emphasis on these skills should continue throughout students' education. For example, research shows that a lack of vocabulary development in very young children has a strong impact on their language development and achievement test scores (Hart & Risley, 1995).

Current K–12 expectations vs. college readiness factors

This section addresses the second research question, "To what extent do current curricula align with college readiness curricula?"

Most state standards do not meet expectations or college and workplace

While students report that they understand the need for postsecondary training and intend to continue their education after high school, many remain unprepared to do so (ACT, 2007b; Barth, 2003). Indeed, a large percentage of high school graduation requirements across the United States appear to fall short of the expectations of colleges or competitive workplaces; according to a 2001 study, only about half of U.S. students graduate from high school having completed even a "mid-level" curriculum as defined by the National Commission on Excellence in Education (Weiss, 2001).

At the college level, post-secondary institutions find that high school graduates arrive less prepared than they have in the past, and many incoming freshman require remedial courses in reading, writing, and mathematics. The National Center for Education Statistics notes that post-secondary remedial education consists of "courses in reading, writing, or mathematics for college-level students lacking those skills necessary to perform college-level work at the level required by the institution" (Parsad & Lewis, 2003, p. iii). Not only are more students requiring remediation, but the amount of time they require for remediation has also increased. And these remediation problems are greatest in "broad access post-secondary institutions," which admit almost every student who applies and educate about 80 percent of the nation's first-year college students (Kirst, 2003, p. 3).

Key finding

The majority of high school graduation requirements across the United States do not require students to meet the expectations of colleges or competitive workplaces.

Similarly, a picture of employers' concerns about the quality of entry-level workers emerges from recent studies that identify significant skill gaps among entering workers. For example, a recent skills gap report from the National Association of Manufacturers/The Manufacturing Institute (Eisen, Jasinowski, & Kleinert, 2005) finds that a majority of American manufacturers are experiencing a serious shortage of qualified employees. In a 2004 poll of employers conducted for Achieve covering some 400 employers from sectors across the economy, employers expressed dissatisfaction with the job that high schools are doing to prepare graduates for several workforce skills, saying that they are dissatisfied with graduates' ability to read and understand complicated materials (41% of employers are dissatisfied), to think analytically (42%), to apply what they learn to solve real-world problems (39%), and to communicate orally (34%) (Hart Research Associates & Public Opinion Strategies, 2005).

In addition to higher order thinking skills, both employers and educators have identified dispositions that are crucial to student success, such as

work ethic and timeliness (Barton, 2006; Conley, 2003). These findings confirmed earlier studies documenting the gap between employer demands and student academic preparation (Holzer, 1997). Perhaps Zemsky's (1997) experience with employer-based focus groups best summarized industry needs. He found that the skills most desired by employers were, "the ability to complete tasks, to get the job done, and to be both self-motivated and trainable—in sum, to be a truly good learner" (p. 53).

Students of color are less likely to receive rigorous curricula

The deficiency in college preparedness is even higher for low-income students and students of color. During the 1970s and 1980s, the achievement gap was cut nearly in half, but since that time, the gap has remained stable and in some instances, widened once again (Haycock, Jerald, & Huang, 2001). As evidence of this gap, students of color remain underrepresented in college preparation courses (Bottoms & Timberlake, 2007; Haycock, 2002; Solórzano & Ornelas, 2004) and are often channeled into a low-rigor curriculum (Ali & Jenkins, 2002). This discrepancy exists despite a large body of evidence that the achievement gap decreases when all students have access to a rigorous college preparatory curriculum (Achieve, 2008b; ACT, 2007a; Ali & Jenkins, 2002; Haycock et al., 2001; Martinez & Klopott, 2005; Weiss, 2001).

Finkelstein and Fong (2008) demonstrated that 9th grade students who take college preparatory classes (namely, English, Algebra I or higher, and foreign languages) tend to finish the full set of requirements needed to enter college; students who do not take these key classes in 9th grade are less likely to meet college entrance requirements by the end of high school. However, these researchers found that minority students are less likely to take these core classes (e.g., half of white and Asian students complete all four years of high school English, compared to one third of African-American and Hispanic students). ACT (2008b) found that 56 percent of African American students who took the ACT had taken core college preparatory courses in high school (i.e., four years of English, Algebra I, Algebra II, Geometry, U.S. History, World History, American Government, General Science, Biology, Chemistry). Nonetheless, just 37 percent of African Americans taking the test met ACT's benchmark for reading (vs. 68% of all test takers) and just 11 percent met the benchmark score for mathematics (vs. 43% overall), prompting ACT to recommend that educators evaluate the rigor of their courses (2008b).

States are now aligning standards with college readiness standards

A joint project between the National Governors Association Center for Best Practices (NGA Center) and ACT studied the alignment of course content to standards and found that when high school courses are well-aligned to academic standards, achievement growth occurs. Specifically, geometry teachers who participated in the project moved into tighter alignment with the ACT standards and with each other, which resulted in higher test scores (National Governors Association Center for Best Practices, 2008). As of 2008, 19 states have aligned their standards with Achieve's benchmarks, and more are in various stages of this process (Achieve, 2008b). Recently, 46 states (and three territories) signed a pledge to work with the National Governor's Association, the Council of Chief State School Officers, College Board, ACT, and Achieve to develop a "common core" of state standards. States will be allowed to join the development process and then decide individually whether to adopt the standards or align them into their current content standards (Council of Chief State School Officers, 2009).

Considerable variance exists in the translation of standards into curricula

Finally, college readiness standards are not intended to articulate a college readiness curriculum; they merely provide guideposts for local educators who must design lesson and unit plans around a statement, such as this middle school standard drawn from College Board (2006):

> Student develops number sense encompassing magnitude, comparison, order, and equivalent representations, which supports reasoning in operating with nonnegative rational numbers in fraction and decimal forms. Student applies these concepts, operations, and properties in solving problems involving relationships among whole numbers and other nonnegative rational numbers.

Obviously, teachers must parse the standard to determine whether it identifies *procedural knowledge* (skills that students should be able to demonstrate), or *declarative knowledge* (key concepts students need to understand) (Marzano, 2003). They must also "unpack" such a statement to identify smaller, more discrete topics embedded in the standard, as well as essential vocabulary terms for students to learn. Once they have identified what needs to be taught, they must structure their lessons so that students are engaged, challenged, and capable of demonstrating the standard. However, as Marzano notes, several studies indicate that "even when highly structured textbooks are used as the basis for a curriculum, teachers commonly make independent and idiosyncratic decisions regarding what should be covered and to what extent. This practice frequently creates huge holes in the continuum of learning" (p. 23).

Citing findings from the Second International Mathematics Study (SIMS), Marzano (2003) notes that discrepancies exist between the "intended" curriculum (i.e., content identified by standards or other documents to be taught), the "implemented" curriculum (i.e., content actually delivered by the teacher), and the "attained" curriculum, (i.e., content actually learned by students) (p. 23). Marzano recommends that districts identify the content necessary for all students to be successful, ensure that teachers can adequately address the identified content given the time they have to provide instruction, and guarantee that teachers focus on the content identified.

Many existing systems for high school credits reward students for "seat time," not attained curriculum

Carnegie units, which establish the amount of time a student must spend on a given subject, but do not typically account for the level of rigor of a particular course, appear to contribute to the differences between intended and attained curriculum. Students often receive the same graduation

Key finding

Students often receive the same graduation credit for courses with widely varying degrees of rigor.

credit for courses with widely varying degrees of rigor. For example, students enrolled in "low-track" or non-college preparatory courses receive the same graduation credit as those enrolled in AP courses within the same subject. Additionally, courses with the same name may not address equivalent content, so students attending the same course may not be held to the same expectations.

Several authors have urged schools to measure student progress by the quality and intensity of content in particular courses, rather than the number of courses taken in a subject area (Achieve, 2004; ACT, 2007b; Kendall & Williams, 2004). The particular courses that students take, not the amount of seat time given to the subject area, prepare them for life after high school. Furthermore, it is important that courses with the same name cover the same content (Achieve, 2004a; Barth, 2003). Conley (2007) recommends reviewing course syllabi to eliminate inconsistencies and ensure courses of the same name address the same content. Bottoms and Anthony (2004) stress the importance of aligning courses to standards to ensure consistency across courses with the same name.

Some states have begun to challenge the Carnegie unit and to create a performance-based credit system in which targeted student populations may receive credit towards graduation requirements by demonstrating competency related to specific skills and knowledge. Other states are pursuing more comprehensive credit-by-proficiency policies that extend to all students.

Alternative curricular pathways

Of the reports examined in this review, many highlighted the importance of pacing, individualization, and real-world contexts in helping all students maintain the motivation to complete high school and continue with postsecondary interests.

Career and technical education curricula increase student engagement, achievement, and earning power

In a study funded by the Bill and Melinda Gates Education Foundation, Peter D. Hart Research Associates conducted a series of focus groups and interviews with 467 ethnically and racially diverse high school dropouts to determine their reasons for not completing school; 47 percent of these students responded "classes were not interesting" (Bridgeland, Dilulio, & Morison, 2006). As one student remarked, "they make you take classes in school that you're never going to use in life" (p. 4). Of the students surveyed, 81 percent said that providing "opportunities for real-world learning (e.g., internships, service learning) to make classroom[s] more relevant" would increase the likelihood of staying in school (p. 13).

A joint publication of the National Governors Association, National Conference of State Legislatures, National Association of State Boards of Education, and Council of Chief State School Officers (2008a) points to a significant body of research that demonstrates that career technical education courses engage and motivate students and lead to lower dropout rates, higher student achievement, and greater earnings for high school graduates. This finding is well supported by students, especially those who left school before completing high school degree requirements. As Bridgeland, Dilulio, and Morison (2006) determined, one of the most meaningful changes to current high school work that would encourage students to stay in school is making the content meaningful and relevant, often through real-world examples. In another study, Bottoms and Anthony (2004) examined 13 Georgia high schools that raised academic expectations and graduation rates

simultaneously and concluded that these schools had provided purpose and meaning for students by offering high-quality career education. Researchers also found that participation in career technical education programs increases earning power after high school, particularly for African American males (Association for Career and Technical Education, 2006; Bottoms & Young, 2008). Thus, high-quality career and technical education (CTE) programs have been called the "missing component" in high school reform (Bottoms & Young, 2008).

Several examinations have found that reading, writing, mathematics, and science content can effectively be woven into technical coursework (Association for Career and Technical Education, 2006; Bottoms & Young, 2008). A study conducted by the Southern Regional Education Board (SREB), for example, found that high schools in the *High Schools That Work* (HSTW) network increased student achievement when they grounded rigorous academic curriculum in high-quality career/technical programs and engaging assignments (Bottoms, 2006). Bottoms and Young's (2008) examination of high-performing high schools in Georgia found that CTE helps students learn how to apply high-level academic skills and knowledge in a way that academic courses typically do not; the variety of real-world contexts helps students master the language and processes associated with academic areas.

Performance-based curricula engage and motivate students

Education reformers often criticize the practice of grouping students primarily by age and providing them all with the same curriculum, despite the fact that student learning progresses at different levels. One alternative to artificial grade-level distinctions is a performance-based system that offers students individualized pathways to learn at their own pace while experiencing rigorous coursework. When students proceed at their own developmental rate, they are more engaged and less frustrated.

Perhaps the best example of a performance-based system is the Chugach School District in Alaska, which changed from a "time-based" system to a "performance-based" system in 1994. Components of the new system are flexible learning structures, personalized student portfolios to document progress, ongoing assessment as needed, heightened levels of student ownership and accountability, and mastery of the same rigorous core curriculum. In this model, students may take more time to achieve a specific competency, but ultimately do so at a higher level of proficiency than is expected in traditional systems (DeLorenzo et al., 2009).

The reform efforts at this particular school district eventually led to the formation of the Reinventing Schools Coalition (2009), which describes standards-based school design as "a system where learning is the constant

and time is the variable." Preliminary data suggest that the Chugach model shows promise in reducing dropout rates, improving achievement, and cutting administrative costs (Broder, 2002). In addition, studies of high-performing, high-poverty schools found that these schools were likely to follow an approach similar to the Chugach model, adopting innovative curricula that embraced the idea of individualized rates of learning rather than a "conveyor-belt system" that aims to move students through the system at the same pace (Steinberg & Almeida, 2008).

Programs providing early exposure to college-level curriculum and environments show promise

Dual-enrollment programs and early college high schools are two alternative learning pathways for "scaffolding" students into college-level learning environments.

Dual-enrollment programs. In some high schools, students take college-level courses for dual credit. That is, when they enroll in college courses, they complete the requirements for their high school diplomas and earn college credits that fulfill the expectations for a college degree (Karp, Calcagno, Hughes, Jeong, & Bailey, 2007). While high school courses designed to deliver college-level content through AP and IB programs provide one option for students to experience rigorous course work, dual-enrollment programs extend this opportunity by placing students in actual college classrooms where they must meet the same expectations as their college-enrolled classmates. Karp et al. (2007) conducted a quantitative study that analyzed the short- and long-term outcomes of students who participated in dual enrollment programs in New York City and Florida and found that while there may be some selection bias in their findings (students who enroll in these programs are likely pre-disposed to college course work and view college as a key to career and life opportunities),

Key finding

Dual-enrollment programs and early college high schools are two alternative learning pathways for "scaffolding" students into college-level learning environments.

low-income students nonetheless benefited from dual enrollment programs more than their peers, including peers with higher grade point averages.

Early college high schools. These high schools blend secondary and postsecondary education, which results in an integrated curriculum for students in grades 9–14. Early college high schools are independent entities, often located on or near a college campus. Within these autonomous structures, students experience the high school and college curriculum as one, eliminating repetition and increasing the opportunity to spend time building expertise in content areas that may require more targeted attention (Huggins, 2004). Although the actual configuration of each early college high school varies, based on the specific partnership between the school and the postsecondary institution, combined effort results in students earning an associate degree or accumulating college credit toward a bachelor's degree, often as much as two years' worth of credit (Hoffman & Vargas, 2005).

A specific type of early college high school is the middle college. In middle colleges, students complete high school by age 16 and earn the remainder of their high school credits doing college-level work on college campuses (Huggins, 2004). A distinction of the middle college is its explicit focus on underserved youth (American Institutes for Research, 2008). Like the dual enrollment programs, early college high schools accelerate students' progress through high school and the first years of college. Based on the premise that students respond to authentic challenges rather than repetition or remediation, early college high schools expose students to challenging academic experiences. These

experiences come with the added benefit of compressing the time it takes for students to complete high school and make progress toward a college degree.

In 2002, the Bill and Melinda Gates Foundation started the Early College High School Initiative (ECHSI). During the following five years, the foundation supported 130 schools, including middle colleges, in states across the country and the District of Columbia. American Institutes for Research (AIR) and SRI International (SRI) conducted evaluations of the ECHSI, with the most recent findings submitted in May 2008. Their work suggests that early college high schools hold promise for students, including underrepresented populations such as students of color and students of poverty. In addition, the study highlights issues needing further exploration. For example, one of the attractions of early college high schools is the promise that instructors will deliver curriculum in an engaging yet challenging manner, which is not always the case. The authors emphasize the importance of professional development that helps teachers create and deliver engaging lessons that motivate students to persevere with their college studies.

These research review findings support rigor in a college readiness curriculum, including Algebra II, four years of high school English, and four years of science. However, more research is needed to inform the design of effective preparation for student success in such high school curricula. It is not clear why such a pattern of course taking is associated with postsecondary success, and more research should examine the factors under educators' control.

Discussion & Recommendations

The options presented here are derived from the findings reported in the previous section. In addition, they were shaped by the research team's understanding of the current "state of play" in this component of the system and in some cases, insights from other literature and knowledge within and outside the field. In addition to the questions described in Step 5 of the Overview of Methodology (see pages 8–9), these questions were used:

- What current practices have a strong enough evidence base that they should be *adopted* and scaled up?
- What current practices show enough promise in certain contexts that they might be *adapted* for use in settings for Our Kids?
- Where are there sufficient unmet needs and lack of promising practices to warrant the *invention* of new practices?

These options for further action are not necessarily mutually exclusive. The Design Collaborative might ultimately choose a path that integrates several of them or includes all of them. Nonetheless, pursuit of any particular option presents challenges or drawbacks. To help the Design Collaborative weigh these challenges, benefits and drawbacks for each option are presented.

Option 1: Develop curricula aligned with the Common Core State Standards Initiative

Currently, 46 states and three territories have pledged to work with the National Governor's Association, the Council of Chief State School Officers, College Board, ACT, and Achieve to develop a "common core" of state standards. According to CCSSO these standards will be

- as rigorous, if not more rigorous, than existing state standards;
- research- and evidence-based;
- aligned with college and work expectations;
- internationally benchmarked against high-performing nations; and
- built on existing efforts to identify college-and career-ready standards.

Whether these new standards, once completed, will be adopted and will accomplish all of these goals is a question (see the discussion in Option 2 for more detail on this concern). This option, however, assumes that the Initiative, which is more simply known as Common Core, is successful in identifying a focused set of internationally benchmarked, rigorous college and workplace readiness standards, and that the majority of states that agreed to join the initiative commit to adopting these standards. Under this option, the Design Collaborative would focus its efforts on designing curricula around the grade-by-grade standards that the Initiative is slated to complete in the fall of 2009. This effort might include identifying additional elements that are crucial to student development, which may not be present or explicit in the common standards, such as meta-cognitive and cognitive skills that students will require for success in college and the workplace.

Potential benefits of this option

Leveraging existing efforts. Common Core has identified many laudable goals which are supported by research. It proposes to benchmark its standards against international standards, which comparisons have found are typically more focused, coherent, and rigorous than standards set for U.S. students. Students abroad focus on fewer topics, yet gain deeper knowledge and more critical thinking skills around those topics than do American students. William Schmidt, a Michigan State University researcher and expert in international standards, asserts that high-

performing countries share the following characteristics:

- Depth of curriculum rather than breadth
- More rigorous curricula, an example being the higher number of students in other countries taking algebra by 8th grade
- Curricular coherence, or a progression of topics that build, thus allowing for further depth of understanding across grades (Coalition for Student Achievement, 2009).

By building curriculum around these standards, the Design Collaborative could avoid duplicating efforts, thus reducing the time spent prior to developing a prototype curriculum for Our Kids.

Creating curricula that go to scale quickly. Ideally, if all or most states that are supporting the development phase of the Common Core Initiative also adopt the standards, a curriculum aligned with the Common Core could be quickly taken to scale in multiple states and territories, thereby maximizing the efforts of the Design Collaborative.

Potential challenges and drawbacks of this option

Developing curricula aligned with standards that are not widely adopted. Similar past efforts have mostly been unsuccessful. For example, the National Governor's Association's 2005 "Graduation Counts Compact" to standardize formulas for calculating graduation rates—a seemingly simpler and less controversial undertaking—initially included all 50 states. Three years later, only 16 states remained part of the compact (Cech, 2008). Already, some states are reserving the right to back out of Common Core; for example, in its letter joining the effort, California wrote, "We will fully participate in the common core development process, but we cannot commit to adopting them until we have determined that they meet or exceed our own [standards]." (Schwarzenegger, Mitchell, O'Connell, 2009). Thus, one potential pitfall of this option would be that the Design Collaborative could design and develop a rigorous curriculum that fails to be adopted in many states.

Attempting to develop curricula aligned with a potentially unmanageable set of standards. A second concern is whether Common Core is able to identify a smaller, more manageable set of standards. A focused set of standards requires removing content that some educators and policymakers think is important enough to include. To illustrate, our current standards documents comprise content that, by one estimate, would take 22 years of schooling to cover (Marzano, Kendall & Gaddy, 1999). In order to keep states and territories on board, Common Core might feel compelled to keep some standards or "bolt on" additional standards as a compromise to retain those states resisting adoption. Consequently, the Design Collaborative might find itself attempting to design a curriculum

around a set of standards that are too broad to be taught in depth or with sound curriculum design principles.

Attempting to develop curricula aligned with standards that lack true college readiness rigor. Those leading Common Core intend to develop standards that address both workplace readiness and college readiness—an assertion supported by a recent ACT (2006b) issues brief which reported that "whether planning to enter college or workforce training programs after graduation, high school students need to be educated to a comparable level of readiness in reading and mathematics" (p. 1). As discussed in more detail in the "Final Thoughts" section of this report, although students pursuing career preparation would benefit from higher expectations, these expectations still fall short of acceptance requirements for (and presumably success in) selective colleges and universities, including most state flagship public institutions. Consequently, it is unclear whether Common Core will identify truly rigorous college readiness standards or a compromise set of standards that fail to set high enough expectations for all students, especially college-bound students. Thus, another concern with developing a curriculum aligned to Common Core is that it might lack the rigor required for college preparedness.

Attempting to develop curricula aligned with standards that may be too broad or vague to guide curricular decisions. Alternatively, to ensure broad agreement and buy-in, Common Core standards could be written at such a high-level of abstraction that they fail to provide clear guidance as to what curriculum should align with the standards, similar to the broad standards adopted by The Partnership for 21st Century Skills (P21). The P21 identifies the following "life and career" and "learning and innovation" skills as essential to student success in the 21st century:

- Flexibility and adaptability
- Initiative and self-direction
- Social and cross-cultural skills
- Productivity and accountability
- Leadership and responsibility
- Creativity and innovation
- Critical thinking and problem solving
- Communication and collaboration (Partnership for 21st Century Skills, 2009).

Critics of the P21's framework assert that it fails to adequately integrate these skills into existing curricula or describe the sequence of how students should acquire these skills (Sawchuck, 2009). For example, in a recent *Education Week* article on the controversy surrounding the P21 standards, Daniel Willingham, a professor at the University of Virginia, argued that cognitive science suggests that critical thinking skills cannot be taught separate from core content (Sawchuck, 2009). One possible drawback to this option, then, is that the Common Core Initiative, in seeking broad consensus among several disparate agencies, might identify similarly vague standards that fail to offer members of the Design Collaborative clear guidance regarding the curriculum to be taught in schools.

Encouraging adoption and proper implementation of the curricula. This final challenge is common to most of the options presented here. Once designed, districts and schools must be encouraged to adopt the curriculum. And to ensure proper implementation, leaders will need training and support to champion and manage the change, monitor its implementation, and ensure a change in culture within the schools adopting it. Similarly, staff will require professional development to properly implement the curriculum.

Option 2: Develop new college readiness standards and curricula

Another option for the Design Collaborative

would be to first adopt, adapt, or synthesize existing college readiness standards into a new set of standards and then design a curriculum aligned with those standards. Briefly, this effort could include identifying or synthesizing a focused set of college readiness standards and integrating into them the cognitive and meta-cognitive skills that research has shown to be correlated with student success—for example, setting and achieving goals (Marzano, 2003), learned optimism (Seligman, 1990) and emotional intelligence (Goleman, 1997). In so doing, this Option might overcome many of the drawbacks identified for Option 1, while encountering a new set of challenges.

Potential benefits of this option

Creating curricula that develop important psycho-social skills. As reported in the findings section, with two exceptions (The Partnership for 21st Century Skills and Transitions Mathematics Project), most college readiness standards documents fail to identify critical habits of mind or cognitive skills that students need for life success. By identifying and integrating into college readiness standards grade-by-grade expectations for these cognitive skills, the Design Collaborative could fill a significant unmet need.

Creating more focused curricula. By limiting the effort to a set of experts, the Design Collaborative could avoid the pitfalls of past standards development efforts, which tended, for the sake of compromise, to include more content than educators could reasonably be expected to cover during students' K–12 careers—let alone teach in depth, while developing higher order thinking skills and important habits of mind.

Creating more rigorous curricula for Our Kids. Given that standards for college and workplace readiness are not as similar as some might hope, the Design Collaborative could develop a comprehensive set of K–12 standards and curricula that ensure Our Kids are prepared to succeed at competitive colleges and universities.

Potential challenges and drawbacks of this option

A lengthy development cycle. Past experience indicates that creating a new set of college readiness standards is a time- and labor-intensive effort. For example, Achieve reports that the American Diploma Project spent two years researching and developing its standards (Achieve, 2009). Once the standards are identified, developing related curricula could entail another lengthy and resource-intensive effort. For example, in *Crash Course*, Chris Whittle (2005) reports that developing a comprehensive design for Edison Schools, which included curriculum, organization, scheduling, data systems, budgeting, and so on, was a two-year $45 million endeavor in the early 1990s. While some of the development cycle could be shortened by adopting or adapting existing standards and curricula, pursuing this option might be a multi-year, resource-intensive effort.

Developing multiple pathways and curricula to serve needs of both college and workplace-bound students. While it's true that many of the same high expectations and levels of knowledge necessary for success in college also are required for the workplace, they are not identical. To serve the needs of both college- and workplace-bound students, the standards and curricula development efforts need to branch into different pathways at some point. Given the time and labor intensive nature of identifying standards and developing related curricula, creating pathways, or learning progressions, for both workplace and college readiness will be a tremendous undertaking, potentially increasing the scope of a standards and curricula development effort many times over.

Creating curricula misaligned with state standards. If the Common Core Initiative successfully creates a set of standards that a large number of states adopt, the college readiness standards and curricula developed by the Design Collaborative might be misaligned with state standards and states' reform efforts, and as a result, fail to gain traction among states and districts.

Option 3: Adopt or adapt an existing college readiness curriculum

One example of a promising high-quality curriculum to examine is the International Baccalaureate (IB) program. IB is articulated all the way from the elementary grades through high school (ages 3–19). Although few, if any, rigorous studies have been conducted to determine the extent to which students taking IB-guided curriculum are more successful in college or the workplace, the IB diploma is widely recognized and valued by many universities around the world, including Oxford and Harvard. In addition, the IB program requires students to demonstrate in their learning profiles evidence of the following characteristics:

- Inquirers
- Knowledgeable
- Thinkers
- Communicators
- Principled
- Open-Minded
- Caring
- Risk-takers
- Balanced
- Reflective

In order for a school to adopt the IB curriculum, teachers, in tandem with principals and program coordinators, must be trained to effectively employ the program. Thus, this option would likely include developing change management expertise from leaders and profession development for teachers (Fullan, 2005, 2008; Heifetz, 1994). According to the International Baccalaureate Organization's Web site (www.ibo.org), training takes place prior to school authorization to participate in the program, and can be administered on the school site or at IB workshops. In addition, once a school is authorized to use the program, teachers receive ongoing professional development at each program level. The IB program offers ongoing workshops and conferences, an online discussion and curriculum center for teachers, a variety of support materials, and opportunities for teachers to become more involved in curriculum-related activities and in the dissemination of the IB program itself.

Additional existing curricula that might warrant further exploration include America's Choice, Advancement Via Individual Determination (AVID), Coalition of Essential Schools, First Things First, GE College Bound, High Schools That Work, Project GRAD, Talent Development High Schools, and The Middle College High School.

Potential benefits of this option

Shortened adoption cycle. In districts where the IB program is already available, students can immediately enroll in the program. Otherwise, implementation of the IB curriculum requires

three phases: a feasibility study, application, and up-front training for the school's teachers; a one-year trial period in which the school is considered a candidate school; and a final authorization visit. Thus, the adoption cycle varies depending on how quickly a school completes the initial application. Because the program and its application process are already in place, however, this option can be adopted more rapidly than those options requiring development and testing of completely new curricula.

Leveraging an existing internationally benchmarked, comprehensive curriculum that also addresses psycho-social skills. Earlier, this report discussed the importance of alignment of expectations and smooth transitions between all grade levels in order to ensure student readiness for postsecondary success—and the fact that no existing college readiness documents provide standards for student learning before middle school. In contrast, the IB curriculum provides a coherent set of programs ranging from the Primary Years Program for ages 3–12, the Middle Years Program for ages 11–16, and the Diploma Program for ages 16–19. The Primary Years Program, in particular, focuses on the whole student, incorporating important social, emotional, physical, and cultural development into the curriculum. This ensures that students from varying cultural and socio-economic backgrounds develop a range of skills and attitudes that are necessary to support and enhance academic growth. In subsequent programs, students are given tools to examine how they learn; foster their own creativity; and continue to develop physical, social, and emotional intelligence.

Providing schools with a curriculum to implement wholesale and online resources for supporting teachers. Additional IB resources are immediately available via ongoing professional development for teachers, including access to workshops, regional conferences, online supports, and networking with other teachers. This is an advantage over developing new curricula because extensive supports are already established and will continue to attract new participants. An extensive network of colleagues, or a "community of practice," can be found via an online curriculum centre, drawing from an international base of 2,650 schools in 136 countries. The centre offers teachers the ability to participate in online discussions and real-time chats, join special events, access existing support materials, and share their own and access other teachers' curriculum materials. Further, ready access to international colleagues in an established forum presents the opportunity for teachers to gain additional perspective and insight into the teaching process.

Potential challenges and drawbacks of this option

Ensuring a high level of teacher involvement and training. The IB curriculum cannot be independently administered by any teacher within a school that chooses to do so. This requires a sub-set of teachers to take the

IB training, commit to teaching the classes, and to sustain the program within their school. This level of involvement requires teachers to devote energy to participating within the culture of their own school and beyond. Furthermore, to ensure that students receive consistent high-quality instruction even within an IB program, great attention must be placed on professional development (Hertberg-Davis & Callahan, 2008).

Encouraging student and parent buy-in. Unless the IB program becomes a school's default curriculum, students must be encouraged to opt into the program in order to maintain coherence throughout their education. This might result in students taking IB classes in a piecemeal fashion at different grade levels. Ideally, students would commit to the entire program and earn the IB diploma. This requires overcoming student concerns about giving up other extra-curricular activities or opportunities, and ensuring access to the program for all students.

Limiting student options to a college preparation program only. Adopting the IB program as the sole default curriculum, without modifications, might limit students who would benefit from CTE coursework or other supports. As noted earlier in this report, the real-world contexts of CTE are found to create high levels of student engagement with academic content and can help students explore and even achieve early certification in career areas of interest.

Ensuring students receive adequate supports to be successful in an IB program. Some research questions whether the IB and AP curricula are flexible enough in their instructional strategies to accommodate the wide variety of student backgrounds found in a typical urban high school. One study of how students in high poverty and highly diverse urban settings responded in AP and IB classes found that increased minority participation in these curricula does not automatically lead to increased academic performance. Students taking AP or IB classes in environments with fewer supports were more likely to drop the classes or program (Kyburg, Hertberg-Davis, & Callahan, 2007; Hertberg-Davis & Callahan, 2008). This suggests that while the IB program offers a readily implemented, rigorous curriculum, it may need to be supplemented or adapted to best serve low-income and minority students with a wide range of cultural backgrounds and learning styles.

Option 4: Create a multi-pathway school district

A multiple pathway curriculum aspires to integrate challenging career/technical education classes with rigorous academic content (Hoachlander, 2008). In these optional pathways, academic and real-world learning are combined into courses centered on different industry sectors, such as finance and business or health science and medical technology. Components of a pathway might include taking the college preparatory curriculum in mathematics, science, and language arts; learning technical skills in a specific industry; garnering work/internship experience; and obtaining extra supports as needed (Hoachlander, 2008). In Arizona and New York, students in CTE programs where teachers taught to academic standards outperformed the rest of the CTE school population on standards exit exams (Association for Career and Technical Education, 2006). As a result, reformers have called for CTE programs to be aligned with both essential college readiness and business standards (Bottoms & Young, 2008). Conversely, research suggests that students engaged in traditional academic preparation become more motivated and engaged when they learn academic content within the real-world learning contexts of CTE programs (Bottoms & Young, 2008; Institute for a Competitive Workforce, 2008).

One approach to offering new pathways is to restructure schools around specific career themes, via career academies, clusters, or pathways. Although rigorous academic core content is still required, in these models the focus on gaining career-related skills and knowledge is central to the school structure. Career academies offer a series of deliberately sequenced courses that build around a specific career theme and address the rigorous academic curriculum (Markham & Lenz, 2002). They can be structured in a variety of ways. For example, Indiana, among other states, is designing a biomedical sciences program, in which students will take a sequence of project-based classes aligned with relevant mathematics and science standards. In Florida, career and professional academy courses result in an associate or bachelor's degree, or certification for a specific industry (Bottoms & Young, 2008). Studies of the California system concluded that students enrolled in career academies obtained higher wage jobs and met university entry requirements at a higher rate than other students. In addition, a few studies found higher rates of postsecondary attendance among students participating in career academies (Hoachlander, 2008).

In 2001, Mapleton School District, an urban fringe district located just north of Denver, Colorado, initiated a small schools model, or their version of a multiple-pathway curricula. Although Mapleton is a relatively small district with approximately 6,000 students, it had struggled to increase graduation rates, particularly for the majority Hispanic and low-income students. The district aimed to offer a breadth of options to its clientele, so it replaced its comprehensive high school with seven types of college preparatory high schools, ranging from an international leadership academy (featuring an IB curriculum) to an expeditionary learning-based school of the arts, with a host of options in between. Several years later, the district restructured its elementary and middle schools, enabling a similar range of options for younger students. In essence, the Mapleton School district created an educational environment in which each school develops expertise in offering a particular course of study, and students identify the program that best suits their needs, learning styles, personal interests, and aspirations. Further, the district's themed high schools offer students opportunities to combine curriculum with practical application in meaningful ways, a characteristic that students often lament is lacking in their current education.

These multi-pathway curricular options are not intended to rigidly direct students into particular career paths. Students opt into the programs or pathways based on their interests and might even discover that a particular pathway is not compatible with their skills or interests and switch to another (Association for Career and Technical Education, 2006). Such programs should allow for flexibility and exploration that results in student awareness of a variety of career options related to their high school and postsecondary

education. As students explore these options, however, school leaders, teachers, and other individuals making curricular decisions must be vigilant, ensuring that all options prepare students for life success.

Potential benefits of this option

Shortening the adoption cycle. One benefit of creating multi-pathway districts is the plethora of options that exist. Given the variety of curricular programs available (e.g., International Baccalaureate, Expeditionary Learning, Core Knowledge), districts can adopt programs rather than invent them. As districts expand their knowledge of programs based on experiences implementing them, the learning they share will inform future adopters, thus shortening the adoption cycle for future users.

Serving needs of both college- and workplace-bound students. Educating students so they can take advantage of multiple career options is a tall order. By organizing a district so that students can select a course of study that fulfills their individual needs, all students are served. This is true as long as districts use a sound monitoring system to assure that students make informed and appropriate choices. CTE programs must function in support of the goal of increased academic achievement, rather than as an alternative track for students viewed as unable to master high standards.

Offering a fertile ground for experimentation and adaptation. The proliferation of curricular programs makes a multi-path approach more tenable for districts. Furthermore, with the potential for broad dissemination, the programs can grow more robust given the diversity of students and districts in which they are implemented. For example, by experimenting with Big Picture Learning in environments such as rural North Dakota or declining industrial cities, such as East Cleveland or Detroit, practitioners could improve the curriculum, adapting it to these new environments. In this way, districts could become laboratories for existing programs, such as IB and KIPP, as well as incubators for new innovations, including a growing number of online curricula.

Potential challenges and drawbacks of this option

Challenging transportation logistics. One of the major challenges to a multi-pathway approach is transportation. The small size of the Mapleton School District in Colorado makes creating a bus system manageable, but doing the same in a district of 70,000 students covering many square miles is a challenge. It is worth noting, however, that many large districts already are divided in quadrants. If each quadrant organized itself into a small, self-contained district, offering a broad range of curricular programs, transportation could be less of an issue. Yet, even this solution has the potential to create a set of other challenges—a disjointed district with varying expectations or one arts-oriented school that must support all quadrants. Managing the transportation issue is a problem to address through an innovation lens.

Educating stakeholders on differences among school models. If a district is organized around multiple curricular programs, all stakeholders must be well-versed in the tenets of each program. Not only do parents or guardians need to be educated about the different programs, but students and school advisors need to be knowledgeable about what programs are best suited to which learning needs and student aspirations. Nonetheless, opportunities may exist to expand the involvement of the community to support the development and maintenance of this knowledge base. For example, the school district could elicit the assistance of local churches to set up school choice fairs or schedule school visits.

Developing broad and sophisticated diagnostic systems to evaluate strengths and talents. A key concern with a multi-pathway district is the potential to sort students into courses of study that limit their life options. Although practitioners and parents may recognize specific aptitudes and guide students into appropriate courses, access to a host of diagnostic tools will support the decision-making process. Existing career identification instruments or personality tests, such as the Myers-Briggs Type Indicator or even an adapted version of Gallup Organization's StrengthsFinder test (Buckingham & Clifton, 2001) could offer a starting place. However, to ensure that students are not tracked or coerced into one line of study based on a limited supply of viable testing instruments, more valid and reliable instruments are needed as well as constant vigilance from district and other officials to ensure that student groups, especially Our Kids, do not fall victim to low expectations.

Obtaining long-term commitment of school board, superintendent, and community. The Mapleton School District has succeeded in transforming itself because of a dedicated school board, a superintendent who has been in office for more than five years, an interested community, and supportive teacher unions. As long as school districts are based in communities, governed by school boards, and led by superintendents, the collaboration and alignment between these entities is critical to the success of a multi-pathway learning environment. In too many school districts, this level of collaboration and joint purpose is nonexistent.

Option 5: Develop computer-based, individualized curricula

In response to a Stupski Foundation request to include, as appropriate, information that falls outside the original scope of the research questions posed for this report (i.e., *What content should be included in a college readiness curriculum? To what extent do current curricula align with college readiness criteria?*), this final option draws upon recent articles and books to address one reason that students give for dropping out of school. According to the survey of 467 high school dropouts cited earlier, nearly half (47%) said that "a major reason for dropping out was that classes were not interesting;" as noted earlier, more than four out of five (81%) recommended providing more real-world and individualized learning experiences; and three-fourths (75%) wanted "smaller classes with more individualized instruction" (Bridgeland et al., 2006, p. iii).

Education technologist Marc Prensky (2005) attributes students' lack of engagement to the curriculum they are provided:

> What they are being served is, for the most part, stale, bland, and almost entirely stuff from the past. Yesterday's education for tomorrow's kids. Where is the programming, the genomics, the bioethics, the nanotech—the stuff of their time? It's not there. Not even once a week on Fridays. (p. 62)

Prensky observes that thanks to electronic media, students today experience incredibly fast-paced learning and information-rich environments outside of school, but while at school, they often feel they must "power down," assuming a slower pace of learning (p. 64). He identifies several traits of game-based experiences that prompt students to engage with a single video game for 100 hours or more: rapid decision making, constant challenges of increasing difficulty, immediate feedback, and balancing of multiple data streams. Prensky suggests that for schools to engage students, their curricula should emulate these traits.

Essentially, then, this final option calls for developing computer-based learning modules that engage students, accelerate their learning, and address their unique learning styles. It would likely require first, adopting, adapting, or inventing college readiness and/or workplace standards, and then developing an online or computer-based curriculum aligned to those standards.

Potential benefits of this option

Creating a curriculum customized to Our Kids' learning styles. In their 2008 book, *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*, Clayton Christensen and his colleagues make the simple (if not axiomatic) assertion that people learn in different ways, "through different methods, with different styles, and at different paces" (p. 23). Yet despite efforts to differentiate instruction, our schools do not individualize instruction successfully. They do not customize curriculum or instruction according to how students learn—incorporating, for example, Howard Gardner's "theory of multiple intelligences," such as linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalist (Gardner, 2006, p. 6). Christensen and his colleagues (2008) assert that "computer-based learning" places students at the center of their own schooling and creates an individualized instructional program that meets the needs and learning styles of each student.

Using "high-tech" to provide students with more "high touch" opportunities. In his book, *Crash Course*, Chris Whittle (2005) likewise envisions a future model of school with a "highly creative, online curriculum" (p. 177), with teachers that circulate through classrooms, providing one-on-one support to students as needed. If students spent much of their day working independently through computer-based learning modules, schools could actually increase class size (and teachers' salaries), while providing students with more opportunities for hands-on, high-touch interactions with teachers. Whittle projects that by using online learning to increase class size, schools and districts could employ fewer teachers than they do today and, as a result, double teacher compensation. This move would help to "move teaching from a field that requires a quasi vow of poverty (barely middle class life) to one that attracts not only those who care, but also those who have plenty of other options" (p. 124).

Creating a potentially "disruptive innovation" that transforms the education system. Christensen and his colleagues (2008) postulate that computer-based learning will become a "disruptive innovation" that creates a "breathtaking 'flip'" in the way education is delivered. By 2018, they predict that half of all content in U.S. secondary schools will be taught online through "student-centric" ways. They base this on the idea that "disruptive innovations"

have, in the past, rapidly transformed entire industries—such as the way the MP3 players and digitally downloaded music transformed the music business in less than a decade, or the way that mail-order DVDs and on-demand cable programming led to the rapid demise of video rental stores. Creating high-quality, student-centric online learning modules could help to accelerate the arrival of this tipping point, providing more students with access to curricula that better meet their learning needs.

Potential challenges and drawbacks of this option

Longer development cycle. Depending on the scope of courses created, this option—from identification of appropriate standards to creation of learning progress to development and design of online curricula—represents a lengthy development cycle. The process could be shortened by choosing a set of existing standards (e.g., Common Core) around which to design the online curricula.

Private- and public-sector competition. Given that a number of private and public-sector providers are already developing and disseminating online curricula, the Design Collaborative would not enjoy a "first-to-market" advantage. Thus, they should consider how their efforts would compete against—or perhaps leverage the established products of— well capitalized competitors. Players in this space include K^{12}, a rapidly growing, publicly traded company that provides online curricula to students worldwide. In 2008, it generated $224 million in revenues (up from $140.6 million in 2007) while enrolling 40,859 students (up from 27,005 in 2007) (K^{12}, Inc., 2009). In its 2008 annual report, the company notes that it has developed a complete high school program and has begun moving into urban markets, creating in Indiana, for example, "two urban hybrid schools that combine online learning with learning in a classroom setting" (p. 2).

In 2008, Edison Schools acquired the education software company Provost Systems ® and changed its name to EdisonLearning. According to the company, the name change and acquisition resulted from a strategic two-year effort to transform themselves from an education management company into an online provider of "achievement management solutions" (Edison Schools, 2008) that serves more than 350,000 students in 24 states. In January 2009, the company announced that starting in the fall of 2009 it will begin enrolling students in an online charter school in South Carolina (EdisonLearning, 2009).

Targeting a more limited audience of "non-consumers." Clayton Christensen's "disruptive innovation theory" posits that most transformative, "disruptive" innovations actually begin not with mainstream consumers of products or services, but with "non-consumers," or people who for various reasons are not willing or able to participate in the market.

For these non-consumers of education—the one million students now educated in home-schools or the one-third of students who drop out of traditional schools—computer-based learning may represent a real improvement. Christensen's theory, if correct, suggests that the most fruitful course of action for the Design Collaborative would likely be to design an online curriculum not for all kids, but rather, for that portion of Our Kids who are current non-consumers of the existing system.

Online learning may not suit every child's learning style or academic needs. Finally, in light of the fact that 38 percent of high school dropouts reported that one of the causes of their academic failure was having "'too much freedom' and not enough rules" (Bridgeland et al., 2006, p. iv) and fully "seven in ten favored increasing supervision in school" (p. v), it's unclear whether the self-guided learning inherent in an online curriculum would meet the needs of all students, especially those who appear to crave more structured learning environments.

Final Thoughts

No one-size-fits-all curriculum

The research findings reported here reveal the complexity of designing curricula for Our Kids. No single pathway or curriculum is ideal for all students. All of the options described in this report rely on a rigorous curriculum that provides students with multiple life options. Even so, there is no one-size-fits-all curriculum.

The authors of the ACT issues brief *Ready for College and Ready for Work: Same or Different*? concluded that "whether planning to enter college or workforce training programs after graduation, high school students need to be educated to a comparable level of readiness in reading and mathematics" (ACT, 2006b, p. 1). However, a close analysis of the data they presented paints a more complex picture of college readiness. The brief reports that the level of reading and mathematics abilities required for these jobs is equivalent to scores of 19–23 and 18–21, respectively, on the ACT reading for information and mathematics tests (p. 3). These score ranges correlate roughly to ACT's "college readiness benchmark" score of 21 on the reading test and a little below its mathematics benchmark of 22. ACT says these benchmarks reflect the scores students need to earn to have a 75 percent chance of earning a C or better in first-year college courses.

Selective universities, however, appear to set a higher benchmark for admitting students than that set by ACT. For example, in a multi-year analysis of the grade point averages, ACT scores, and college enrollment patterns of several thousand students in the Chicago Public Schools system, researchers at the Consortium on Chicago School Research determined that students with a composite score of 21 had only a 28 percent likelihood of enrolling in "selective" or "highly selective" colleges, such as the University of Illinois at Chicago, the University of Illinois at Champagne Urbana, and DePaul University (Roderick, Nagaoka, & Allensworth, 2006).

These researchers note that the selectivity of institutions in which students enroll is important because students are far more likely to graduate when enrolled in selective schools. For example, the six-year graduation rate at University of Illinois at Champagne-Urbana, a "very selective" institution according to Barron's ranking of colleges, is 81 percent compared with just 15.2 percent at Chicago State University, a "non-selective" institution (Roderick et al., 2006). In addition, the gap noted earlier between ADP's workplace-oriented standards and Standards for Success's college-oriented standards offer further evidence of differing expectations employers and college faculty have for high school graduates.

Setting "common expectations" for all students, regardless of whether they choose to attend college or enter the workforce may be *necessary* for some students, but it is likely not *sufficient* for all students. Students seeking to enter the workforce after high school may require additional career-specific training in order to be competitive in the workforce, and those students seeking to enroll in selective colleges or universities, including many states' flagship public institutions, need additional preparation beyond a common expectation. In addition, offering the same curriculum to all students could undermine the benefits that real-world, career-oriented coursework appears to have in increasing student engagement and motivation.

In summary, while the ACT recommendation to offer common expectations for all students

is sensible, it should not be over-simplified or translated into a common curriculum for all students. The middle college approach described earlier in this report (see p. 23) may point a way forward—namely, accelerating students' learning so that they complete common expectations halfway through their high school careers, at which point they could opt to pursue a rigorous college preparation pathway or career preparation pathway, or a combination of both.

The perils of "teacher-proof" curricula

In the 1960s, several national curriculum projects sought to create what were sometimes publicly billed as "teacher-proof" curricula—research, development, and dissemination efforts that sought to create "modern" classroom materials that incorporated the most recent research and theory about effective curriculum and had been rigorously field tested. In the end, though, most of these programs were never widely adopted nor did they have much effect on classrooms, due in large part to, as later researchers found, the variability of instruction in those classrooms—even when delivering the same curriculum (Hall & Hord, 1987).

While this report examined curriculum in an isolated context, the authors recognize that curriculum cannot be separated from the rest of the system. Indeed, even the most carefully crafted curriculum is only effective when delivered through sound pedagogical practices to students who are motivated and supported. In fact, many of the studies cited in this report point to the importance of "high touch" in classrooms and schools—as perhaps a complement to "high tech" innovations. Two examples of innovative curriculum models, the Re-inventing Schools Coalition and Big Picture Company, which allow students to pursue highly individualized learning pathways, complement student self-directedness with ongoing opportunities to interact with caring adults who help guide them in their pursuits. It's worth noting again that, according to the survey of dropouts cited earlier, three-fourths of students who quit school said they wanted smaller classes with more individualized instruction (Bridgeland et al., 2006).

These survey findings further suggest that a missing ingredient for some students is a positive school culture, which many view as a school that sets high expectations for academics and behavior for all students. For example, the following data points emerged in the survey:

- 38% of dropouts said they had too much freedom and not enough rules
- 66% said they would have worked harder if more had been demanded of them
- 80% said they did one hour or less of homework each night
- 70% favored increasing supervision in school

- 62% felt more classroom discipline was necessary
- 57% believed their high schools did not do enough to help students feel safe (Bridgeland et al., 2006)

While a more rigorous, engaging curriculum may be a key to creating better schools for Our Kids, these intangible issues appear to be equally important. Indeed, after studying high-poverty, high-performing schools, researchers from Mass Insight concluded that successful schools adopt a high-touch model of schooling, one which "evokes … the sense of a medical team rallying to each student, backed by a whole system of skilled professionals, processes, and technologies organized and ready to analyze, diagnose, and serve the goal of learning" (Calkins et al., 2007, p. 3).

Balancing customization with standardization

Lastly, some findings of this report seem paradoxical: On the one hand, they note the importance of a demanding curriculum for all students, while on the other hand, they call for flexible approaches to how students engage in the curriculum, pursue their interests, and develop their unique talents. Calls for a single more rigorous curriculum reflect concerns that, in the past, tiered approaches to curriculum (or "tracks") have lowered expectations for Our Kids, who often were disproportionately placed in lower track courses. Since the early 90s, policymakers and educators have pressed for higher standards for all students to guard against unequal expectations and outcomes for students. Some have noted that this difference in tracking accounts for differences among the performance of U.S. students on international comparison tests and those of countries such as Japan and Germany, which identify college-bound students early in their academic careers and channel them into more rigorous academic preparation or less rigorous career preparation tracks.

In light of current statistics showing that approximately one-third of students drop out of school, while another third require remediation in high school or college to remain in school, the current one-size-fits-all approach to curriculum is only serving a third of U.S. students. Furthermore, experiments in innovative curricula that embrace the idea of individualized rates of learning rather than a "conveyor-belt system" that aims to move students through the system at the same pace have shown promise in improving student engagement and achievement (Steinberg & Almeida, 2008). Simply put, the curriculum must be meaningful and engaging, as well as rigorous. The challenge, then, is to strike a balance between setting a high bar for all students and meeting the unique needs of all learners. Perhaps the best way to strike this balance would be to develop or adopt a rigorous core curriculum for all students, such as that being created by the Common Core Initiative. A rigorous curriculum could be the starting point for a more in-depth learning experience, be it a challenging college preparation program or a demanding real-world career and technical education program.

Granted, potential pitfalls could befall efforts to offer students multiple career and college preparatory pathways. The first would be allowing Our Kids to become over-represented in less rigorous pathways or curricular options. To be effective and fair, a more flexible curriculum would need to be complemented with adequate supports and guidance to ensure that Our Kids are equally represented in demanding coursework and learning opportunities that reflect high academic and workplace aspirations.

The second pitfall might be political. Earlier efforts to integrate career preparation into academic preparation, most notably the federal School-to-Work Opportunities Act of 1994, ran afoul of public opinion. Some parents expressed concern that the program would cater too much to corporate interests instead of the needs of their

children and feared it would shunt their kids into non-college programs. Some conservative groups criticized the program as an unwarranted federal intrusion into schooling (some even went so far as to denounce it as thinly veiled Communism), perceiving the program as an effort by the government to control the economy by sorting and selecting students into different fields and professions (Vo, 1997).

Thus, any effort to develop multiple pathways for students should reflect the strongly held American values of individual freedom, equality, and self-determination. While providing students with tools and other resources to help them identify their strengths and interests, students should not be forced into particular career pathways; rather, they should be allowed to choose their course of study and change their course of study at any point in their academic careers so that every pathway remains open to every student.

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Appendix

Literature review method

In June 2008, the Stupski Foundation created a conceptual framework for the reinvention of American education. The framework identified seven essential components and focused on delivering 21st century college readiness for all students, but especially for "Our Kids," children of color and poverty. The Foundation explained that "graduating all students from high school with the knowledge and skills that qualify them as 'college ready' is the most meaningful and measurable way to increase life choices and options for all children, but most especially children of color and poverty" (About the Foundation, para. 3).

The Learning System includes four core teaching and learning components: Curriculum, Assessments, Pedagogy, and Supports. Surrounding these components, are three organizational components necessary to support the core: Leadership/Human Capital, Systems Diagnostics, and a Dashboard of College Readiness Indicators (College Readiness Learning System, n.d.).

The Foundation envisions convening a Design Collaborative, a cross-sector group of researchers, practitioners, and designers from inside and outside education, to "define, develop and continually improve" (Design Collaborative, n.d.) all of the components. To orient Design Collaborative members to the accumulated and maturing knowledge base related to each of the components and to children of color and poverty, the Foundation contracted with Mid-continent Research for Education and Learning (McREL). McREL conducted eight literature reviews—one on each of the components plus one on Our Kids—to identify and integrate theories and philosophical perspectives, issues, scientifically based research practices, unmet needs, and innovations relevant to designing one or more of the system components to accelerate learning for Our Kids.

This Appendix contains a description of the review method, including a general explanation of McREL's approach and descriptions of the particular procedures used for each phase of the review: identification of key hypotheses and research questions, literature search, identification and cataloguing of finds, and generating and communicating recommendations.

McREL's overall approach

Since the primary users of the reviews are the members of the Design Collaborative, the qualitative, iterative approach taken for the literature reviews sought to achieve the multiple goals of identifying emerging ideas, counterproductive orthodoxies, and promising practices relevant to the reinvention of the Learning System. Thus, eight research teams were assembled, each with one or more researchers familiar with the respective topic areas.

Qualitative approach. A *qualitative approach* shares several practices with those of *systematic reviews,* including comprehensive searches and transparency to reduce bias, but it differs with respect to inclusion/exclusion criteria. Systematic reviews emphasize explicit and a priori inclusion/exclusion criteria and criteria for evaluating the methodological quality of individual studies, carefully limiting the sources of evidence to support inferences about cause and effect relationships (Cooper, Hedges, & Valentine, 2009). The qualitative approach emphasizes diverse sources and types of evidence and knowledge to support a broader base of inferences (Pope, Mays, & Popay, 2007; Suri & Clarke, 2009).

The qualitative approach is particularly well-suited to the review's purpose and audience because the Design Collaborative needs both empirical studies and other literature to identify possible innovations for the current education system. An assumption underlying the Foundation's work to fundamentally reinvent American education is that the current system fails to deliver college readiness for all students, especially Our Kids. This assumption is supported by research indicating that students of color and in poverty have low high school and college graduation rates, and research from the last two years shows that college graduation rates for minority and poor students have further declined (American Council on Education, 2008). Therefore, a priority for the Foundation's work is to identify innovations that have not yet been studied, with the intent to evaluate their effectiveness. Literature specific to innovations is found outside the traditional scientific or academic journals.

Inclusive approach. McREL researchers adopted an inclusive approach, searching for and including phenomenological reports describing the experiences of Our Kids in and out of school and documenting the challenges and successes of their teachers and educational leaders. The researchers included literature on innovative, emerging models and untested ideas, as well as reports on mature, well-specified models with experimental evidence of effectiveness. Relevant quantitative research literature included correlational and experimental studies and meta-analytic reviews. Narrative reviews of research were included, as were policy briefs and position papers produced by opinion leaders and professional organizations. Literature sources included the World Wide Web, peer-reviewed journals, and practitioner magazines. Each document was identified by type of literature and evaluated in terms of the quality of the supporting evidence. Care was taken to draw only those inferences appropriate to the quality of the evidence.

McREL researchers judged the quality of the evidence in the context of the type of literature or study design and in relation to its relevance to answering particular questions. Guidance from Pope, Mays, and Popay (2007) on conducting reviews in the field of health research supports this approach:

> The inclusion of diverse sources of evidence in a review does not mean abandoning the rigor of a systematic review, but it does mean judging the quality of evidence in context and defining the relevance of evidence to answering specific questions, rather than defining some forms of evidence as intrinsically, and universally, of lower quality than others. (p. 1)

Table 1: Phases of a literature review

Phase	Cooper, Hedges & Valentine (2009, p. 8)	Suri & Clarke (2009, p. 414)	McREL 's approach
1	Problem formulation	Drawing from pertinent philosophical and theoretical discussions	Identification of key hypotheses
2		Identifying an appropriate purpose	Identification of research questions
3	Data collection	Searching for relevant evidence	Literature search
4	Data evaluation	Evaluating, interpreting, and distilling evidence	Identification and cataloguing of findings
5	Analysis and interpretation	Constructing connected understanding	Generating and communicating recommendations
6	Public presentation	Communicating with an audience	

Each research team followed the five or six phases of any review process relevant to a quality knowledge synthesis (Cooper, Hedges & Valentine, 2009; Suri & Clarke, 2009). Table 1 (see p. 56) provides a side-by-side comparison of the phases of a systematic review of research (Cooper, Hedges & Valentine, 2009), a qualitative review (Suri & Clarke, 2009), and McREL's approach to this review.

Each team began by drawing from pertinent philosophical and theoretical literature and preliminary discussions with the Foundation to formulate hypotheses and research questions. Each team conducted extensive searches to find as much relevant literature as possible in order to include literature from the scientific and academic journals as well as literature from harder-to-find, cutting edge innovators. Additionally, teams revisited databases and alternative sources to purposefully search for additional literature written by authors identified by one or more stakeholders or to fill conceptual gaps that became apparent during the identification and cataloguing of findings and generating and communicating recommendations phases.

The phased process was iterative (Cooper, 2009) ref ecting new understanding and insights as the search, analysis, interpretation, and discussions between component teams and between the Foundation and McREL progressed toward conceptual clarity and the exhaustion of new search hits. The number of documents included in each team's review was extensive, and the types of literature varied representing the experiential knowledge of a diverse group of stakeholders, including researchers, teachers, administrators, program developers, and leaders and scholars at the local and national levels.

Team approach. Teams were composed of researchers and practitioners with different areas of expertise. Teams met weekly, and team leaders from across teams met biweekly. Meetings were used to update other individuals and teams and share resources, pose and address questions, challenge assumptions, provide guidance on interpretation of evidence, open up new areas of consideration, clarify boundaries and overlap between system components, consider alternative perspectives, and develop connected understanding.

Identification of key hypotheses and research questions

McREL teams began by clarifying terms, relationships, and the conceptual scope of each review. Teams read and discussed a document produced during the Foundation's strategy definition process, *Research Guide for CRLS: Outline of Research Questions for Each Component of the CRLS* (n.d.). Included in this guide were preliminary questions for each literature review. Teams previewed relevant literature, confirmed that the questions could be answered by the extant knowledge base, and posed additional questions when important issues related to accelerating learning for students of color and poverty were identified in the literature but missing in the guide. The revised set of questions for each system component and Our Kids was reviewed and refined during ongoing dialogue between the Foundation and McREL.

Literature search

Multiple searches were conducted in a phased approach to identify as much literature as possible related to each system component and Our Kids. Teams conducted searches using multiple bibliographic databases: Academic Onefile, Academic Search Premier, Educators Reference Complete, ERIC, JSTOR, Proquest, and PsychInfo. Teams also conducted manual searches of journal and book tables of contents and reference lists of articles. Additional searches were conducted specifically to identify recent experimental and other research and reviews on the efficacy of

interventions for accelerating learning of students of color and poverty. These searches were conducted by visiting the U.S. Department of Education What Works Clearinghouse Web site (http://ies.ed.gov/ncee/wwc/reports/) and the Campbell Collaboration Library of Systematic Reviews Web site (http://www.campbellcollaboration.org/library.php). Relevant documents were identified on state education agency (SEA) Web sites, and SEA officials were interviewed or named as seminal authors or sources of models that had been developed and implemented to monitor and accelerate learning of Our Kids.

Each team identified and used key terms and synonyms relevant to the topic for searching. Searches were conducted for literature published in the most recent 10 years (1998–2008); however, works by seminal authors and other recommended literature were included from outside these years. The search landscape varied for each team based on the topic and relevant sources; for example, while What Works Clearinghouse was a relevant source for the Pedagogy team, it was not a relevant source for the Leadership/Human Capital team. Internal review of search records and results led to additional leads on sources. Searching continued until all recommendations had been implemented and/or few new hits were identified.

Identification and cataloguing of findings

A coding protocol was developed and implemented to categorize the literature. Each team used the same protocol, adding categories and decision rules, as needed to organize the particular literature relevant to their topic. Each team leader and one or more members of each team were trained on the decision rules in the coding protocol and provided follow-up support to resolve uncertainties in its application. Team leaders periodically conducted quality assurance reviews of completed coding sheets and updated the protocol as needed during weekly team leader meetings or discussions with the Foundation. The coding protocol included identifying the following information:

- Full APA reference citation
- Category of literature (i.e., primary and secondary relevance)
- Type of literature (e.g., quantitative study, policy brief, program description)
- Locale
- Outcome
- Grade level
- Program or innovation name and description
- Main findings or points
- A recommendation for or against summarizing and including the selection in an annotated bibliography.

In addition, component teams added to the protocol by categorizing relevance to particular parts of their conceptual model or concept map.

Guidelines were developed and used by teams to identify counterproductive orthodoxies, unmet needs, next practices, promising practices, and best practices based on type of literature and quality of evidence. These were defined in the following ways:

- *Counterproductive orthodoxies*: Conventional ways of providing education which may be impeding success of Our Kids

- *Unmet needs:* Areas where Our Kids are not yet well served by the current system of education
- *Next practices:* A program or practice that needs to developed, adapted, invented, and tested in response to an unmet need related to accelerating learning for Our Kids
- *Promising practices:* Practices based on research but not supported by rigorous efficacy data from randomized controlled trials
- *Best practices:* Practices demonstrated by one or more randomized controlled trials to be effective in improving outcomes for Our Kids

The research team reviewing the college readiness component of the learning system employed a slightly different process. Rather than using the categories above, this team reviewed literature on college readiness and categorized findings into four essential areas as defined by the Foundation and Conley (2007): cognitive strategies, content knowledge, academic behaviors, and contextual skills.

Component teams met weekly to discuss and categorize findings and to develop a conceptual map of the insights gained from the literature summaries and review. Teams used different conceptual mapping tools (e.g., SmartArt) to organize the insights (findings) and presented and discussed their respective maps at cross-team meetings. Features common across teams' concept maps were identified and a standard framework developed. Teams arranged findings onto the concept maps, identifying conceptual gaps and conf icting or discrepant findings, and returned to searching and reviewing to fill in the gaps and resolve or explain discrepant findings. The conceptual maps served as an organizing framework for report construction.

Generating and communicating recommendations

Working collaboratively, component teams drew conclusions from the insights (findings) derived from the review and identified potential options and recommendations for each component of the system. Teams used an iterative process of identification, reviewing for validity against the knowledge base, and further refinement until they determined they had identified the most promising options and that each was informed by the existing knowledge base.

Team leaders used the outcomes of team discussions and cross-team discussions, literature summaries, and the researcher's own review and integration of the literature to write a draft report of the findings. Draft reports were reviewed by knowledgeable internal experts and revisions in search strategies, interpretations of findings, and/or conclusions were made. Revised reports were reviewed by the Foundation and other outside reviewers prior to final revisions and production.

Although the wide-ranging literature searches produced reports on extensive baseline information related to Our Kids and each system component, the reports are living documents. As living documents, they bridge the creative and scientific enterprises of the past and present, and we envision the need to return to some of them for updating, extending, and drilling-down in the future.

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